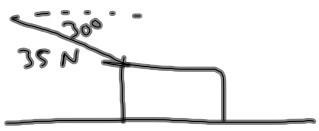
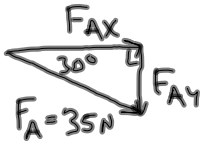
A box of mass 10 kg is being pushed across a horizontal surface by a force of 35 N at an angle of 30° S of E.

If the coefficient of friction is 0.105, what is the acceleration of the box?

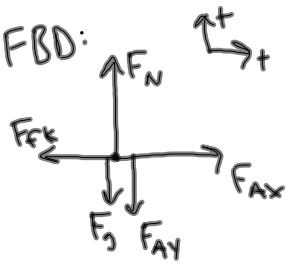




$F_{AX} = F_A \cos(30°)$
$= 30.31\ N$

$F_{AY} = F_A \sin(30°)$
$= 17.5\ N$

FBD:



$\sum F_x = ma_x$

$a_x = \frac{\sum F_x}{m} = \frac{F_{AX} - F_{fk}}{m} = \frac{30.31N - 12.12N}{10\ kg}$

$= 1.82\ m/s^2$

$F_{fk} = \mu_k F_N$
$= (.105)(115.5\ N)$
$= 12.12\ N$

$\sum F_y = \emptyset$

$F_N - F_g - F_{AY} = \emptyset$

$F_N = F_g + F_{AY}$
$= (10\ kg)(9.8\ m/s^2) + 17.5\ N$
$= 115.5\ N$

TEST Thursday

HW due tomorrow

Fundamental Forces:

- Gravitational
  - Weakest
  - Acts over the longest distance
  - Anything with mass has gravitational force
- Electromagnetic
  - Medium-strength
  - Acts only on charged particles
- Strong Nuclear
  - Strongest force
  - Holds nucleus together
  - Acts over very short distances (1E-15 m)
- Weak Nuclear:
  - Helps to hold nucleus together
  - Acts over very, very short distances (.001E-15 m)

Arnold Strongman and Suzie Small pull on opposite ends of a rope in a tug of war. The greatest force exerted on the rope is by

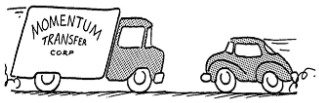
a) Arnold

b) Suzie

c) ... both the same

(Assume the rope's mass is negligible.)

IF A MACK TRUCK AND A VOLKSWAGEN HAVE A HEAD-ON COLLISION, WHICH VEHICLE WILL EXPERIENCE THE GREATER IMPACT FORCE?



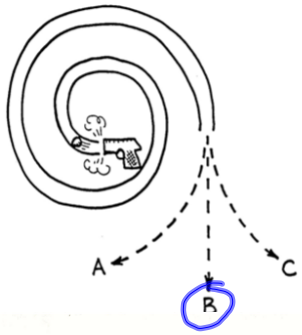
a) THE MACK TRUCK

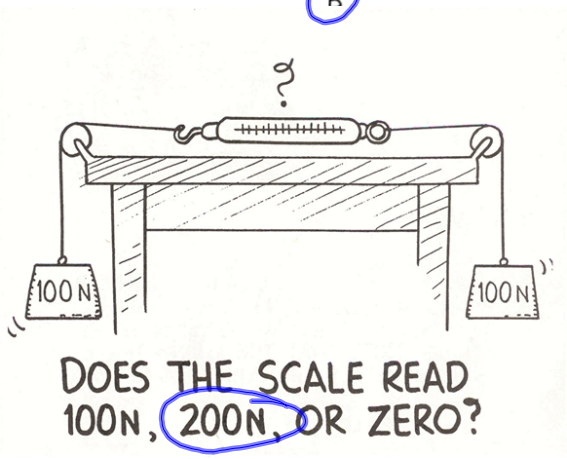
b) THE VOLKSWAGEN

c) BOTH THE SAME → Newton's 3rd law

d) ... IT DEPENDS ON OTHER FACTORS

WHEN THE PELLET FIRED INTO THE SPIRAL TUBE EMERGES, WHICH PATH WILL IT FOLLOW? (NEGLECT GRAVITY)

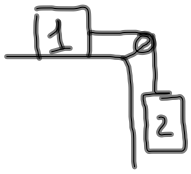




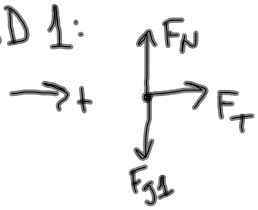
DOES THE SCALE READ 100N, 200N, OR ZERO?

Pulley I Problem:

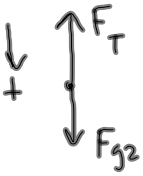
One block is on a frictionless surface and has a mass of 10 kg. A second block is attached by a rope over a pulley and is hanging and has a mass of 5 kg. When they are released, what is their acceleration?



FBD 1:



FBD 2:



Boxes have two things the same:
- F_T
- acceleration

$\sum F_{1x} = m_1 a$

$F_T = m_1 a$

$\sum F_{2y} = m_2 a$

$F_{g2} - F_T = m_2 a$

$F_{g2} - m_1 a = m_2 a$

$m_2 a_g - m_1 a = m_2 a$

$m_1 a + m_2 a = m_2 a_g$

$a(m_1 + m_2) = m_2 a_g$

$$a = \frac{m_2 a_g}{m_1 + m_2}$$

$$= \frac{(5\text{ kg})(9.8\text{ m/s}^2)}{10\text{ kg} + 5\text{ kg}}$$

$$= 3.27\text{ m/s}^2$$